Claims

[1] An ion beam irradiation apparatus comprising:

a vacuum chamber which is to be evacuated to a vacuum;

an ion source which is disposed inside said vacuum chamber, and which irradiates a substrate to be processed with an ion beam that is larger in width than the substrate;

a substrate driving mechanism which drives the substrate in said vacuum chamber in a direction that is substantially perpendicular to a width direction of the ion beam emitted from said ion source;

a rotation shaft which is passed through said vacuum chamber, and a center axis of which is located in a place separated from said ion source toward the substrate, and substantially parallel to a surface of the substrate;

an arm which is disposed inside said vacuum chamber, and which supports said ion source through said rotation shaft; and

a motor which is disposed outside said vacuum chamber, and which reciprocally rotates said rotation shaft,

said ion source being supported to be rotatable about said center axis of said rotation shaft.

[2] An ion beam irradiation apparatus according to claim 1, wherein a distance between said center axis of said rotation shaft and the surface of the substrate is equal to or less about a half of a width of said ion source on a side of a rotation direction, or a width on a side of an outlet of said ion source.

[3] An ion beam irradiation apparatus according to claim 1 or 2, wherein said rotation shaft and said arm are configured by a hollow magnetic member to have a magnetic shielding function, and set to a ground potential, and a conductor through which an electric power is supplied from an outside of said vacuum chamber to said ion source is passed through in said rotation shaft and said arm.

[4] An ion beam irradiation apparatus according to claim 1, 2, or 3, wherein a beam measuring instrument which measures a current density distribution in the width direction of the ion beam emitted from said ion source is disposed at a position which is inside said vacuum chamber, and which is opposed to said ion source across a passage for the substrate, said ion source being located at a predetermined angle with respect to the substrate.

[5] An ion beam irradiation apparatus according to claim 4, wherein said beam measuring instrument is disposed at a position opposed to said ion source which is located at an angle that is substantially perpendicular to the substrate.

[6] An ion beam irradiation method which uses an ion beam irradiation apparatus according to claim 4 or 5, wherein said method comprises the steps:

locating said ion source at an angle at which said ion source is opposed to said beam measuring instrument, and, with using said beam measuring instrument, measuring the current

density distribution of the ion beam emitted from said ion source;

then determining whether the measured current density distribution is within a predetermined allowable range or not, proceeding to a next step if within the allowable range, and, if not within the allowable range, adjusting the current density distribution to be within the allowable range;

then locating said ion source at a predetermined angle required for processing the substrate; and

then applying a process on the substrate by irradiating the substrate with the ion beam from said ion source while driving the substrate by said substrate driving mechanism.